The Impact of Seeding Date on the Yield and Quality of Oats

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Abstract

Most of the research conducted on the optimum seeding date of oats has been done outside of western Canada. The objective of this research is measure the effect of planting dates and cultivars on the yield and quality of oats. Four seeding dates, early May, Mid May, early June, and mid June and four cultivars, AC Medallion, AC Juniper, CDC Boyer and CDC Pacer were used. Delayed seeding resulted in reduced yield and quality of oats. Seeding dates had a larger effect on yield and quality than cultivars except when a high level of crown rust was present in the field. Early and mid May planting dates tend to provide farmers with the least amount of risk when growing oats.

Introduction

In Western Canada, oats are quite often planted in late May or early June. However, most studies suggest that the optimum planting date should be early in the growing season and as seeding is delayed, seed yield and seed quality is reduced (Ciha 1983; Humphreys et al. 1994 and Schmidt 1960). But, none of these studies were conducted in Western Canada. One study conducted at Indian Head from 1891 to 1894 found that the mid May seeding dates had the highest yield (Saunders 1895). Producers can not plant every crop first, but knowing what their potential reduction in income will be from delaying the planting of oats will help them manage the order in which they plant their crops. In addition four cultivars were used to determine if the optimum seeding date among the cultivars differed.

Materials and Methods

Field experiments were conducted at Brandon, Indian Head, Saskatoon and Melfort in 1998 and 1999. The experimental design was a 4 by 4 factorial with four replications except at Saskatoon where a split plot design was used. There were four seeding dates, early May, Mid May, early June, and Mid June and four cultivars, AC Medallion, AC Juniper, CDC Boyer and CDC Pacer. At Brandon, Indian Head and Melfort the plots were direct seeded into standing stubble. At Saskatoon the plots were seeded into tilled soil that had been in fallow for at least one year. The seeding rate for each cultivar was calculated to provide a plant density of 300 plants m^{-2}. The target level of nitrogen was 100 kg ha^{-1}, as a combination of residual nitrogen and fertilizer nitrogen. Phosphorous, potassium and sulfur were applied as needed

Data was collected on plant density, panicle density, seed density, height, lodging, rust, maturity, seed yield, seed weight, test weight, thin seed, plump seed, groat yield and dockage. The data was analysed using Proc GLM in SAS (SAS 1996) Mean comparisons were done using a protected LSD.

Results and Discussion

In 1998, the general trend at all four locations was that yields decreased as planting was delayed (Table 1 and Fig. 1). Yields decreased from May15 to June 15, by 61 bushels per acre at Indian Head , 36 bushels per acre at Melfort and Saskatoon. Even at Brandon there was a statistically significant linear decrease in yield as planting was delayed. At Melfort there was an interaction between the cultivars and seeding date (Fig. 1). CDC Boyer had a lower yield than the other cultivars when planted at early and mid May. There were significant differences among the cultivars at Saskatoon and Brandon. The differences among cultivars, however, were much smaller than the differences among planting dates, except at Brandon. In other words, if you planted after June 1st and don't like the yield you obtained don't blame the cultivar.

In 1999 the same trends occurred with yields decreased as planting was delayed (Fig. 2). At Melfort the yield of all four cultivars decreased as planting was delayed. No crown rust was observed on the oat plants at Melfort. At Indian Head the rust susceptible cultivars CDC Pacer and AC Juniper had higher yields than AC Medallion and CDC Boyer on the first planting date (Fig. 3). At the mid May planting date there were no differences among the cultivars and as seeding was delayed seed yield of all cultivars declined. However, from early June to mid June the yield of the rust susceptible cultivars CDC Pacer and AC Juniper decreased the most, 60 bu/ac, followed by CDC Boyer, 40 bu/ac, which has some resistance to crown and AC Medallion, 24 bu/ac, with the best resistance to crown rust. The amount of crown rust infecting the oat cultivars was fairly constant from early May to early (Fig. 4). After Early June the level of rust infection on AC Juniper, CDC Pacer and CDC Boyer increased while AC Medallion had very little rust. This increase in crown rust occurred at the exact same time that differences occurred among the cultivars. At Brandon, the yield of all cultivars increased from early May to mid May after this the yield of AC Juniper, CDC Pacer and CDC Boyer decreased, while the yield of AC Medallion increased until early June before decreasing (Fig. 5). The low yields at Brandon were due to the wet conditions in May and crown rust. The severity of the crown rust increased from mid May to mid June (Fig. 6). Producers face two factors, deteriorating environmental conditions and crown rust, which can reduce their yield when they delay seeding their oats.

In 1998, test weight decreased at Indian Head and Melfort as seeding was delayed. The trend at Saskatoon and Brandon was less obvious. In 1999, at Melfort the mid May seeding date had the best test weights and the test weights of all the cultivars decreased as seeding was delayed (Fig. 7). At Indian Head there was a slow decrease in bushel weight from early May to mid May for all the cultivars except AC Medallion (Fig. 8). The largest decrease in test weight occurred when seeding was delayed from June 1 to June 15. The bushel weight of both rust susceptible cultivars CDC Pacer and AC Juniper was 26.5 lb bu^{-1}. At Brandon the test weight of CDC Pacer, AC Juniper and CDC Boyer were low at any planting date (Fig. 9). There was a

general decrease in test weight as seeding was delayed. CDC Medallion was not affected by crown rust and it's test weight did not decrease until mid June. As with yield test weight decreased when planting was delayed especially if rust susceptible cultivars are grown when crown rust is present. The test weight required by millers varies among the millers. Can-Oat milling requires a test weight of 40.9 lb bu^{-1} (235 g $0.5L^{-1}$) and other millers want 42.5 lb bu^{-1} (245 g $0.5L^{-1}$). Seeding in early or mid May does not guarantee a test weight acceptable to the milling industry but it does improve the chances of a grower having an acceptable test weight.

Conclusions

1) delayed seeding reduced the yield and quality of oats.
2) Seeding date had a much larger affect on yield and quality than cultivar except in the presence of crown rust.
3) Producers incur more risk as seeding is delayed

Table 1. The Effect of Seeding Date and Cultivars on the Yield of Oats in 1998.

	Indian Head	Saskatoon	Brandon
Planting Date		Bushels/acre	
May 1	127 *a*	-	60.0*a*
May 15	126 *a*	103 *a*	58.2*a*
June 1	91 *b*	94 *b*	48.4*a*
June 15	65 *b*	67 *c*	
Cultivar			
AC Medallion	102.3*a*	85.2*b*	50.4*ab*
CDC Pacer	103.1*a*	94.9*a*	59.8*ab*
AC Juniper	105.1*a*	85.0*b*	48.9*b*
CDC Boyer	99.1*a*	87.0*b*	63.0*a*
CV	9.4	4.7	29
SE	3.4	1.7	5.7

a-c Values for planting date or cultivar within a column followed by the same letter are not different at $P<=0.05$ by protected LSD.

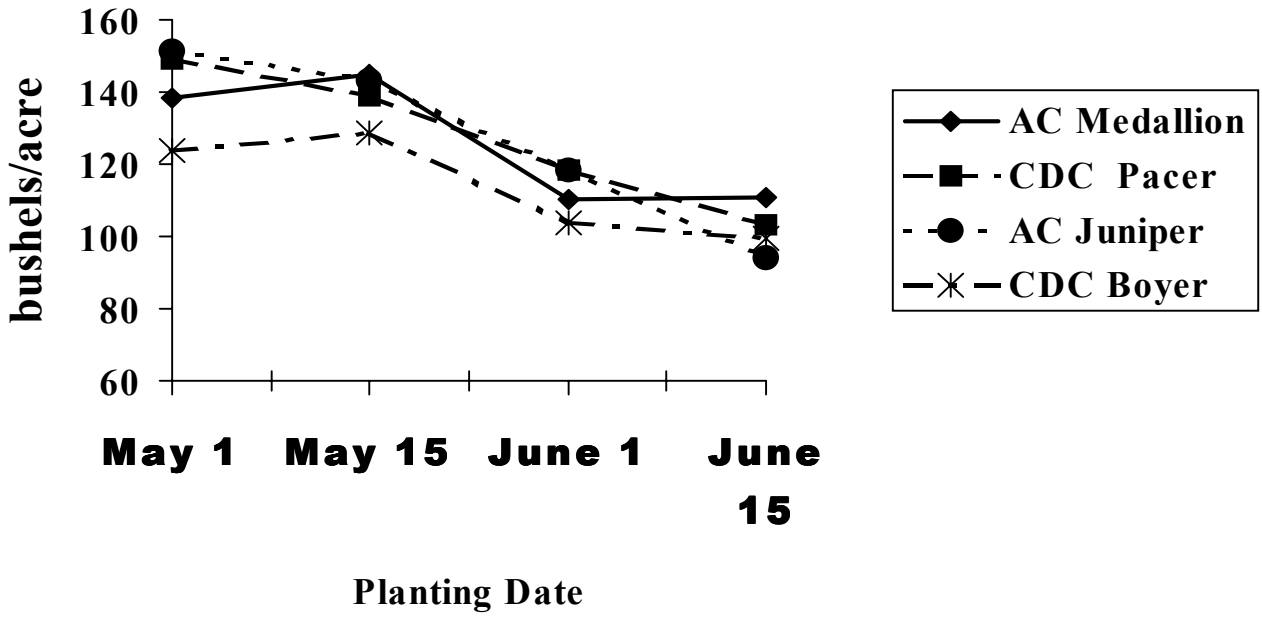

Figure 1. The effect of planting date on the yield of four oat cultivars at Melfort in 1998.

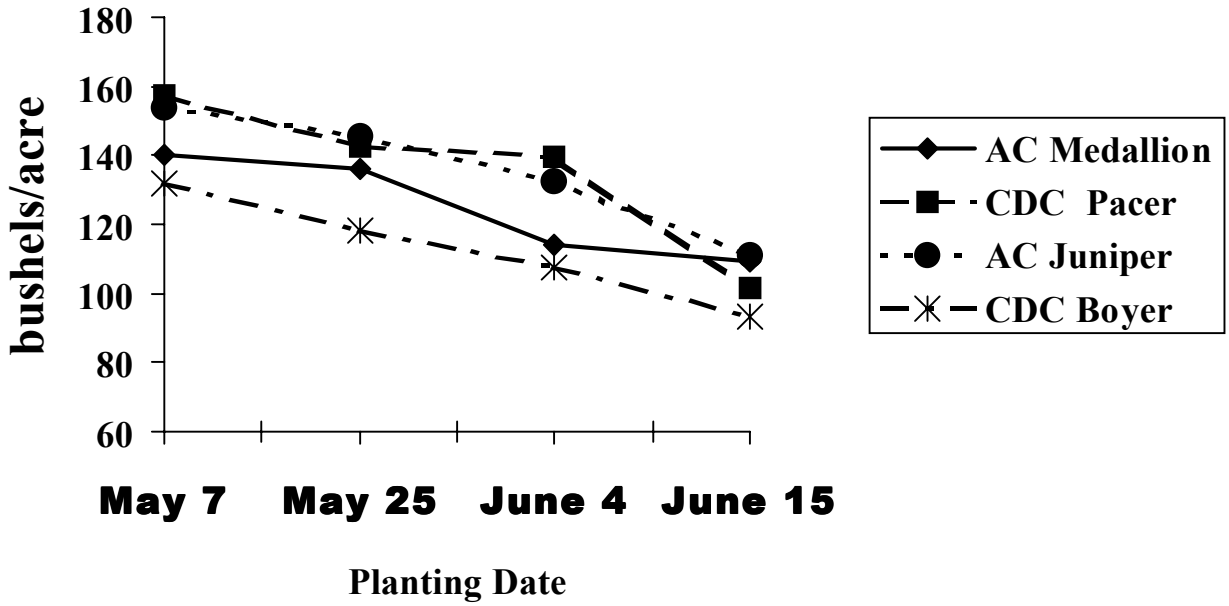

Figure 2. The effect of planting date on the yield of four oat cultivars at Melfort in 1999.

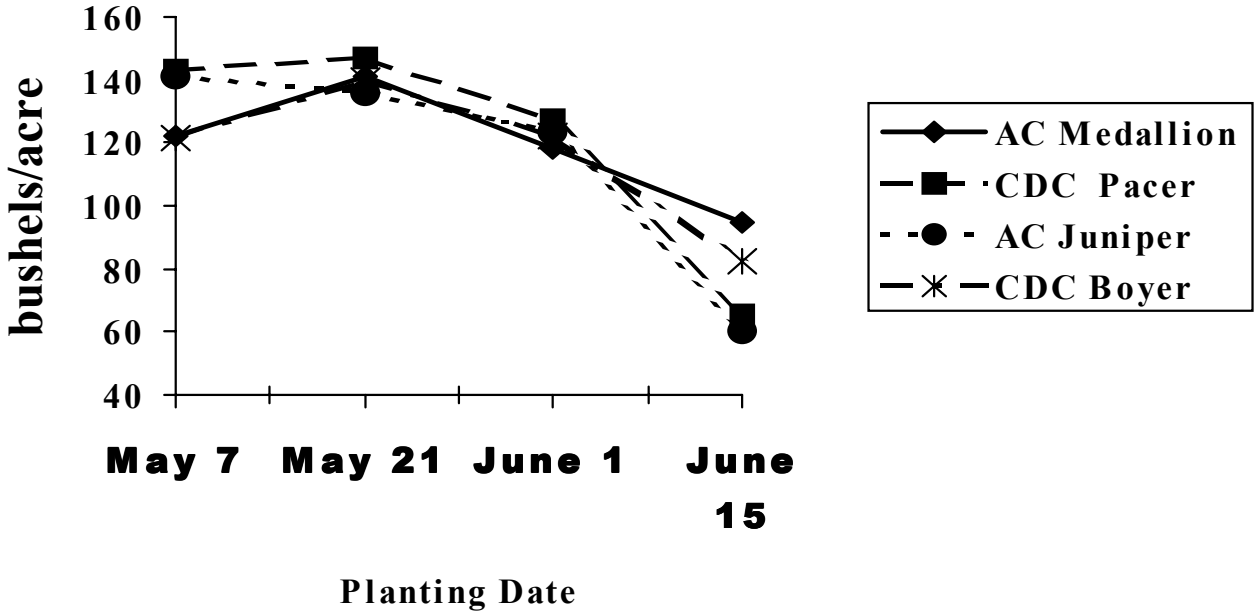

Figure 3. The effect of planting date on the yield of four oat cultivars at Indian Head in 1999.

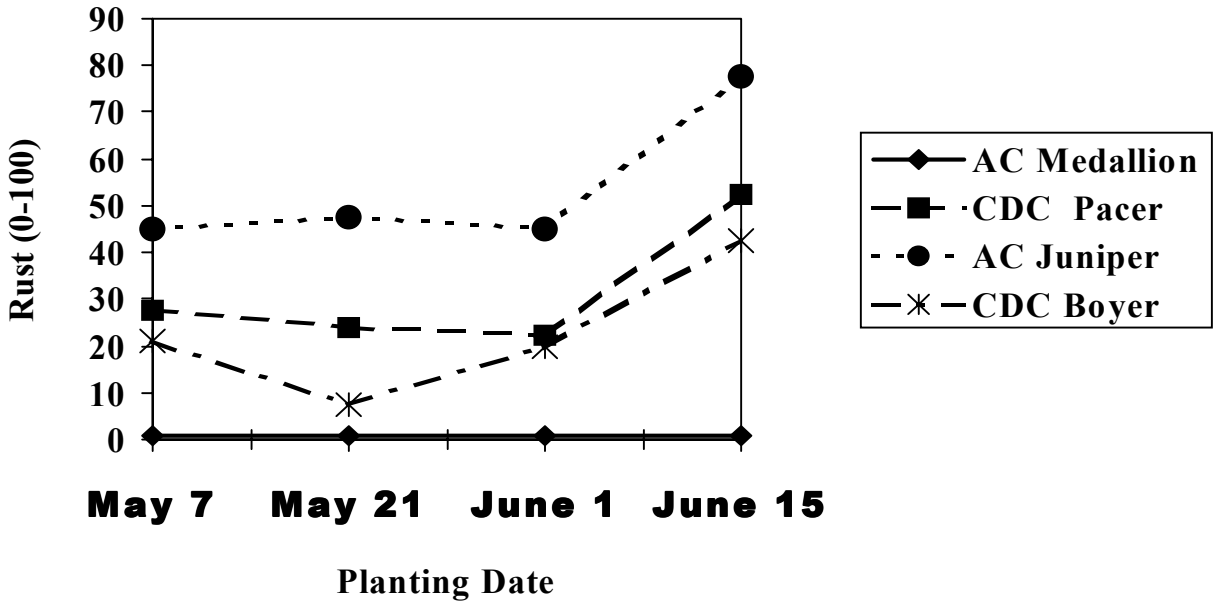

Figure 4. The effect of planting date and four oat cultivars on crown rust at Indian Head in 1999.

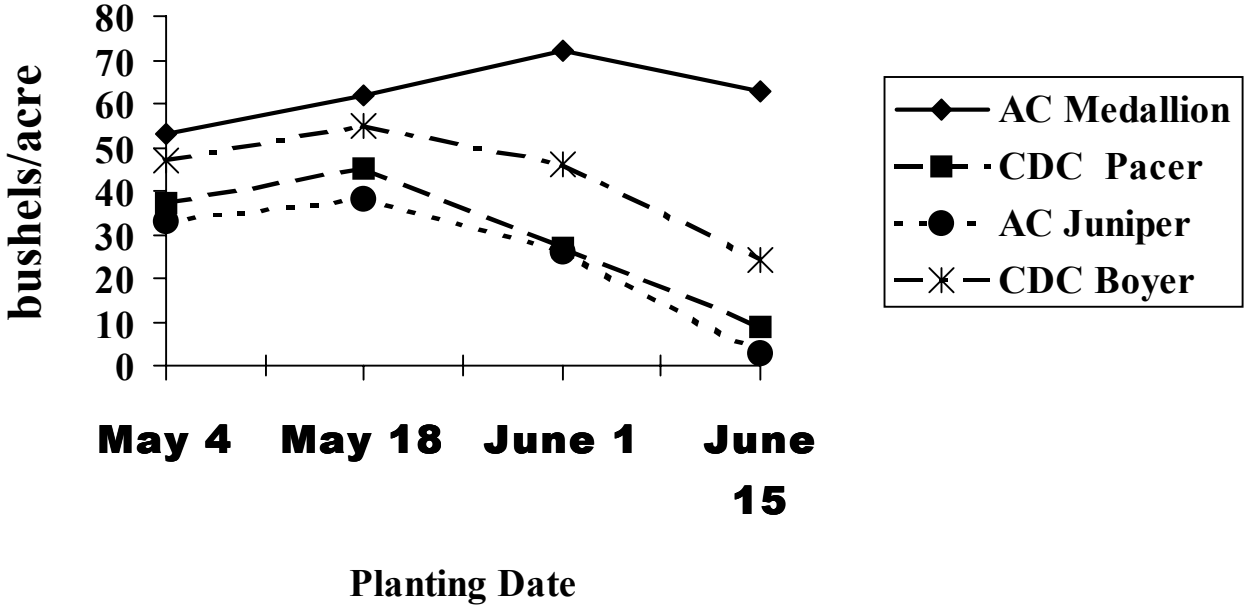

Figure 5. The effect of planting date on the yield of four oat cultivars at Brandon in 1999.

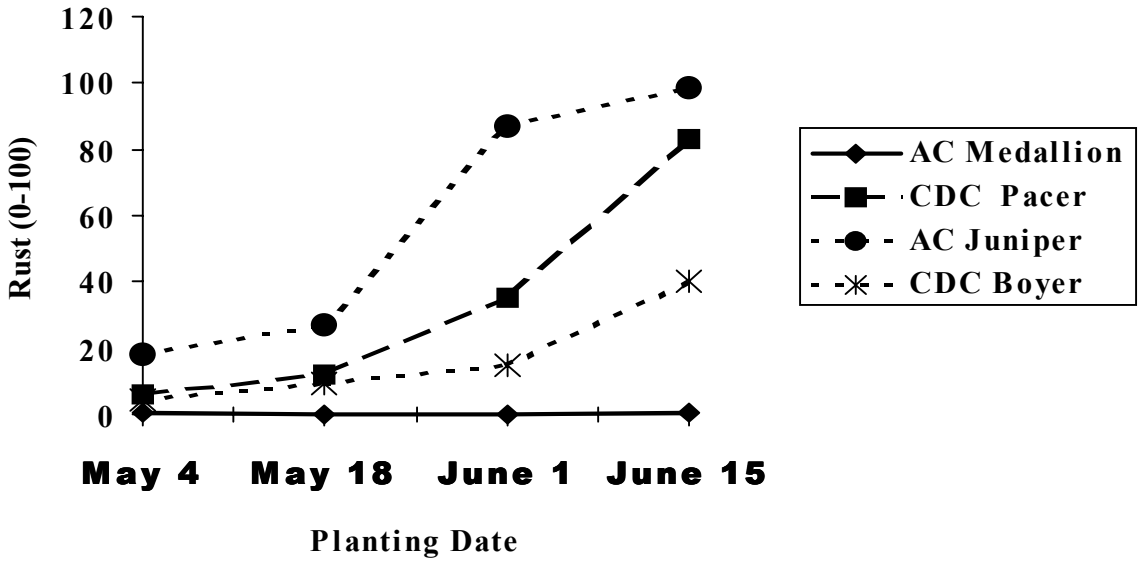

Figure 6. The effect of planting date and four oat cultivars on crown rust at Brandon in 1999.

Table 2. The Effect of Seeding Date and Cultivars on the Test Weight of Oats in 1998.

	Indian Head	Saskatoon	Melfort	Brandon
Planting Date		Bushels/acre		
May 1	42.0*a*		44.1*a*	35.2*b*
May 15	42.0*a*	41.5*ab*	43.8*a*	38.8*a*
June 1	37.2*b*	40.4*b*	41.4*c*	35.3*b*
June 15	37.9*b*	42.6*a*	43.0*b*	
Cultivar				
AC Medallion	40.7*a*	41.2*bc*	43.3*ab*	34.0*b*
CDC Pacer	39.6*b*	42.5*a*	43.8*a*	37.9*a*
AC Juniper	39.1*b*	41.4*b*	42.8b*c*	36.1*ab*
CDC Boyer	39.6*b*	40.9*c*	42.3*c*	37.7*a*
CV	2.8	1.3	2.4	12

a-c Values for planting date or cultivar within a column followed by the same letter are not different at $P <= 0.05$ by protected LSD.

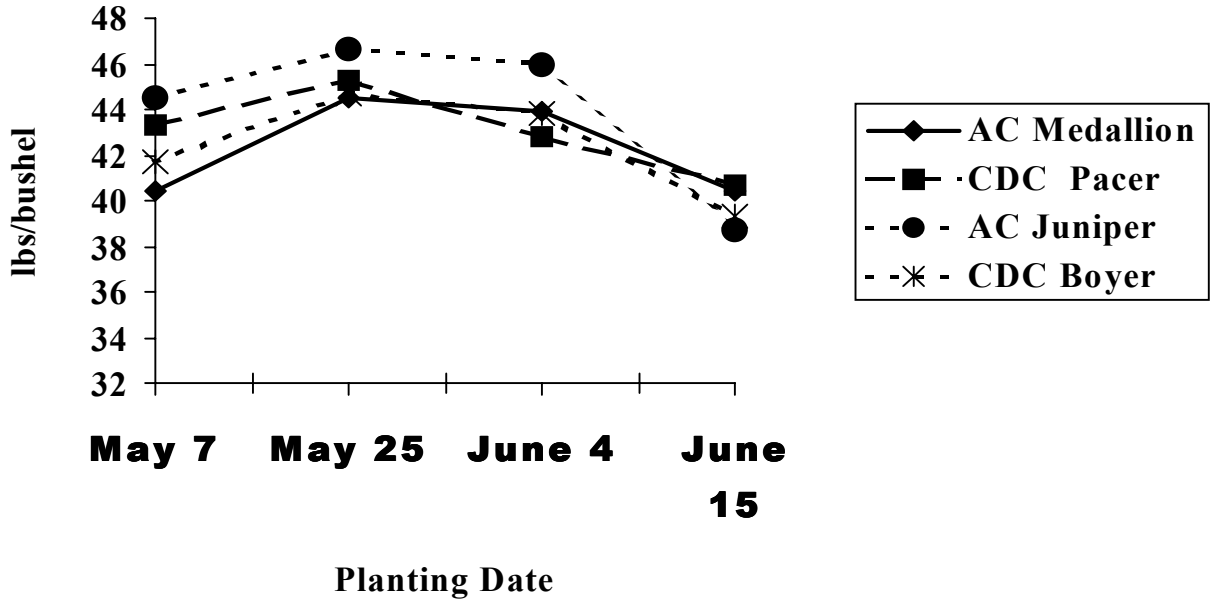

Figure 7. The Effect of Seeding Date and Cultivars on the Test Weight of Oats at Melfort in 1998.

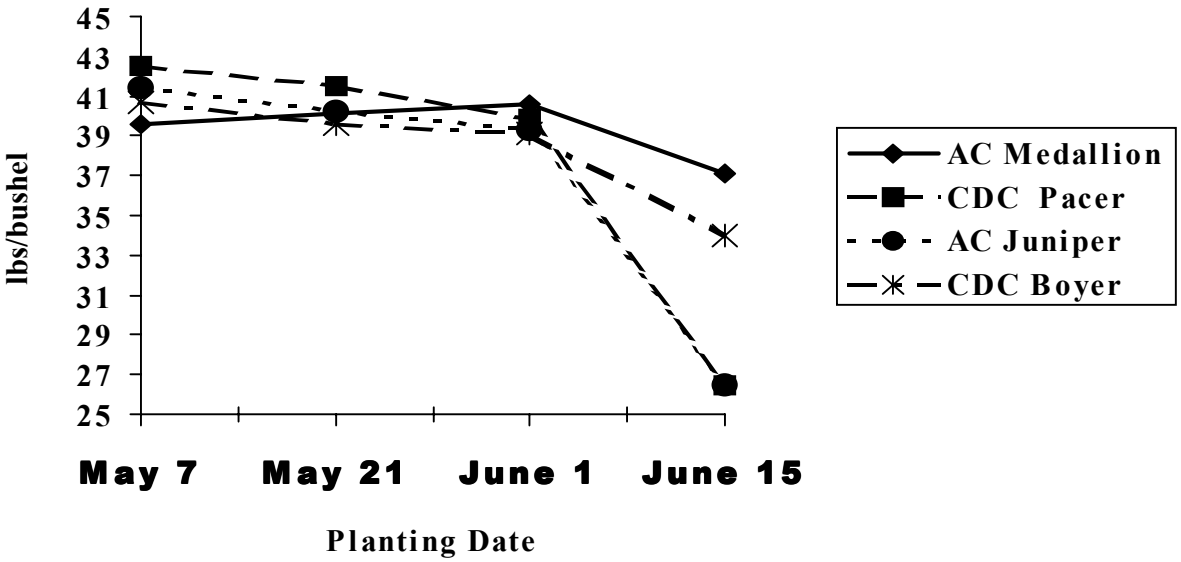

Figure 8. The Effect of Seeding Date and Cultivars on the Test Weight of Oats at Indian Head in 1998.

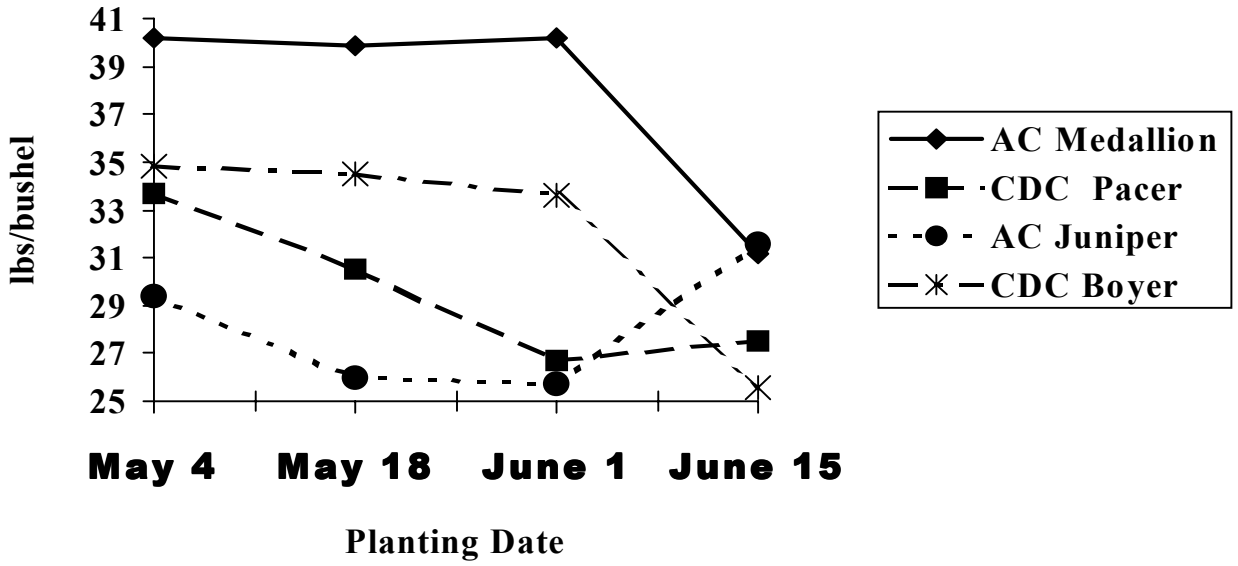

Figure 9. The Effect of Seeding Date and Cultivars on the Test Weight of Oats at Brandon in 1998.

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